

## **Motion and Forces, Problem Based Learning**

### **I Rationale:**

This lesson will direct teachers to a NASA site containing an instructional packet that uses rocketry as the focal point for teaching. The lessons provide a medium for addressing physical science concepts, integration of math skills, and design technology. In addition, a long-term problem based learning activity is provided as part of the packet.

### **II Procedures:**

1. Recommended Activity
  - Try out the activity at the following link,  
[http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Project\\_X-35.html](http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Project_X-35.html)

### **III Content Standards Addressed:**

#### **National Science Education Standards:**

- **A.1.2** – Design and conduct a scientific investigation
- **A.1.3** – Use appropriate tools and techniques to gather, analyze, and interpret data
- **A.1.4** – Develop descriptions, explanations, predictions, and models using evidence
- **A.1.7** – Communicate scientific procedures and explanations
- **A.1.8** – Use mathematics in all aspects of scientific inquiry
- **A.2.4** – Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations
- **B.2.1** – The motion of an object can be described by its position, direction of motion, and speed
- **B.2.2** – An object that is not being subjected to a force will continue to move at a constant speed and in a straight line
- **B.2.3** – Unbalanced forces will cause changes in the speed or direction of an object's motion
- **B.3.1** – Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways
- **B.3.5** – In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers
- **E.1.1** – Identify appropriate problems for technological design
- **E.1.2** – Design a solution or product
- **E.1.3** – Implement a proposed design
- **F.1.2** – The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions

#### **National Council of Teachers of Mathematics:**

- **A.3.1** – Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods

- **A.3.4** – Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios
- **B.1.1** – Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules
- **C.1.1** – Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties
- **C.4.5** – Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom
- **D.1.3** – Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume
- **D.2.1** – Use common benchmarks to select appropriate methods for estimating measurements
- **D.2.2** – Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision
- **D.2.5** – Solve problems involving scale factors, using ratio and proportion
- **D.2.6** – Solve simple problems involving rates and derived measurements for such attributes as velocity and density
- **F.1.2** – Solve problems that arise in mathematics and in other contexts
- **F.1.3** – Apply and adapt a variety of appropriate strategies to solve problems
- **F.4.3** – Recognize and apply mathematics in contexts outside of mathematics

**National Education Technology Standards:**

- **A.2.1** – Students understand the ethical, cultural, and societal issues related to technology
- **A.3.2** – Student use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works
- **B.4** – Use content-specific tools, software, and simulations to support learning and research

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